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(54) METHOD OF FABRICATING A FIRE DETECTOR AND FIREDETECTOR

VERFAHREN ZUR HERSTELLUNG EINES FEUERDETEKTORS UND FEUERDETEKTOR

PROCEDE DE FABRICATION DE DETECTEUR D'INCENDIE ET DETECTEUR D'INCENDIE

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(73) Proprietor: **Matsushita Electric Works, Ltd.**
Kadoma-shi, Osaka-fu 571-8686 (JP)

(72) Inventors:
- **NISHIKAWA, Takayuki**
  Kadoma-shi, Osaka 571-8686 (JP)
- **KIRIHATA, Shinji**
  Kadoma-shi, Osaka 571-8686 (JP)
- **WADA, Takeshi**
  Kadoma-shi, Osaka 571-8686 (JP)
- **KAWANO, Yasuyuki**
  Kadoma-shi, Osaka 571-8686 (JP)
- **OKA, Shoichi**
  Kadoma-shi, Osaka 571-8686 (JP)
- **SAKAMOTO, Koji**
  Kadoma-shi, Osaka 571-8686 (JP)

(74) Representative: **Goddar, Heinz J., Dr.**
FORRESTER & BOEHMERT
Pettenkoferstrasse 20-22
80336 München (DE)

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Description

[0001] The present invention is related to a method of fabricating a fire detector, and more particularly to a method of fabricating various types of fire detectors by selecting a combination of common units, and to fire detectors thus fabricated.

BACKGROUND ART

[0002] There have been proposed a wide variety of fire detectors designed for specific purposes or situations. In terms of a fire sensing elements, the fire detectors can be classified generally into three types of using a smoke sensor, a thermal sensor, and a combination thereof. Also, the fire detectors can have different schemes of determining an outbreak of fire or fire-presence, for example, by analyzing a sensed parameter of the smoke density and/or temperature in accordance with a sophisticated program, or simply by comparing the parameter with a reference value. Further, the fire-presence signal may be simply a short-circuit signal on a transmission line to a receiver, or may carry address assigned to each detector for precisely locating the presence of fire at the receiver. Therefore, depending on specific particular needs in consideration of a scale of fire detection system, an environment, cost and other factors, the detector is selected from a large number of combinations of the sensing elements, the fire-presence determination schemes, and the transmission of the fire-presence signal. The detectors of different specifications have been fabricated individually as different models in conformity with various needs. However, the different models are normally designed to have exclusive parts some of which are not shared with other models. This becomes critical when most of the parts of the detector are integrated into a single chip. Therefore, a manufacture has to prepare and stock a large kinds of exclusive parts for production of various types of the detector, which leads to a cost increase of the fire detector.

[0003] EP 0,571,843 AI discloses a fire detector with a smoke sensor, whereas this fire detector is capable of being adjusted with respect to its sensitivity in order to not erroneously output any fire signal.

[0004] EP 0,729,123 A 1 discloses a multiple sensor detection system with a first sensor or a fire detector and a second sensor or environmental condition detector. Representatives of said first sensor include fire, gas, temperature, intrusion sensors or the like, whereas said second sensor includes humidity, ambient pollution level, time of day, presence or absence of sun light, or the presence or absence of individuals in the region being monitored.

[0005] From Japanese Patent abstracts JP-03/250395 a scattered light type smoke sensor is known, whereas this sensor can be formed by providing a switching means in an on/off type sensor circuit and by adding an analog sensor circuit prepared separately.

DISCLOSURE OF THE INVENTION

[0006] In view of the above problem, the present invention has been accomplished to provide a method which enables to fabricate various models of fire detectors only from a limited number of common parts or units. Therefore, it is a primary object of the present invention to provide a method which is capable of producing various models of fire detectors in accordance with user's specific needs at a reduced cost. The method in accordance with the present invention utilizes a smoke sensor unit **1,** a thermal sensor unit **2,** a signal processing unit **3,** a signal transmission unit **4,** and a power unit **5,** and then combines at least one of the smoke sensor unit and the thermal sensor unit with the power unit and optionally with at least one of the signal processing unit and the signal transmission unit.

[0007] The smoke sensor unit is provided to sense a smoke density and generate a smoke density signal indicative thereof, in addition to generating a fire-determination signal indicative of the fire-presence or not as determined based upon the sensed smoke density. The smoke sensor unit includes a power input terminal **T11** for receiving an operating voltage, a smoke density output terminal **T13** for providing the smoke density signal, and a fire-determination output terminal **T14** for providing the fire-determination signal.

[0008] The thermal sensor unit **2** is provided to sense an environmental temperature and generate a temperature signal indicative thereof. The thermal sensor unit includes a power input terminal **T21** for receiving the operating voltage, and a temperature output terminal **T22** for providing the temperature signal.

[0009] The signal processing unit **3** is provided to determine the fire-presence based upon any of the smoke density signal and said temperature signal, and to generate a fire-determination signal. The signal processing unit has a smoke density input terminal **T33** for receiving the smoke density signal, a temperature input terminal **T32** for receiving the temperature signal, a fire-determination output terminal **T34** for providing the fire-determination signal, an interrogation signal input terminal **T35** for receiving an interrogation signal, and a power input terminal **T31** for receiving the operating voltage.

[0010] The signal transmission unit **4** is responsible for signal transmission with a receiver **6** and is configured to convert the fire-determination signal into a multiplex signal for multiplex transmission to the receiver, and to transform the interrogation signal from the receiver into a suitable format to be processed at the signal processing unit **3**. The signal transmission unit has a power input terminal **T41** for receiving the operating voltage, an interrogation input terminal **T45** for receiving the interrogation signal, a fire-determination input terminal **T42** for the fire-determination signal, an interrogation signal output terminal **T43** for transmitting the interrogation signal, and an multiplex signal output terminal **T46** for transmitting the multiplex signal to the receiver

through the power unit.

[0011] The power unit **5** is provided to give the operating voltage and includes a switch circuit **18** which is connected to the receiver for providing a short-circuit signal when the fire-determination signal indicates the fire-presence. Also included in the power unit is a transfer circuit **52** which transfers the interrogation signal from the receiver to the signal transmission unit as well as the multiplex signal from the signal transmission unit to the receiver. The power unit has a power output terminal **T51** for providing the operating voltage, a multiplex signal input terminal **T56** for receiving the multiplex signal, an interrogation output terminal **T55** for providing the interrogation signal, a fire-determination input terminal **T54** for receiving the fire-determination signal, and a port **T52, T53** for connection with the receiver.

[0012] Since each unit is configured to have the input and output terminals for immediate connection with those of a corresponding unit or units, the detector in any desired combination of the units can be readily assembled.

[0013] In a preferred embodiment, at least one of the smoke sensor unit, the thermal sensor unit, the signal processing unit, the signal transmission unit, the power unit is prepared in the form of an integrated circuit for facilitating the assembly of the detector, in addition to making the detector compact.

[0014] One example of the fire detector fabricated in accordance with the present invention is equipped with all the units **1** to **5**, in which the smoke sensor unit **1** has the smoke density output terminal **T13** connected to the smoke density input terminal **T33** of the signal processing unit **3**, the thermal sensor unit **2** has the temperature output terminal **T22** connected to the temperature input terminal **T32** of the signal processing unit **3**, the signal processing unit **3** has the fire-determination output terminal **T34** connected to the fire-determination input terminal **T42** of the signal transmission unit **4**, the signal processing unit **3** has the interrogation input terminal **T35** connected to the interrogation output terminal **T43** of the signal transmission unit **4**, the signal transmission unit **4** has the multiplex signal output terminal **T46** connected to the multiplex signal input terminal **T56** of the power unit **5**, the signal transmission unit **4** having the interrogation input terminal **T45** connected to the interrogation output terminal **T55** of the power unit **5**, and the power unit **5** has the power output terminal **T51** connected to the power input terminals **T11, T21, T31,** and **T41** of the smoke sensor unit, the thermal sensor unit, the signal processing unit, the signal transmission unit.

[0015] These and still other objects and advantageous features of the present invention will become more apparent from the following description of the embodiment when taken in conjunction with the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

FIG. 1 is a schematic sectional view illustrating a fire detector fabricated in accordance with a preferred embodiment of the present invention;

FIG. 2 is a plan view of various integrated units of the above detector mounted on a printed board;

FIG. 3 is a circuit block diagram illustrating one example of the fire detector; and

FIGS. 4 to 11 are circuit block diagrams illustrating other different examples of fire detectors respectively fabricated in accordance with the present invention.

MODE FOR CARRYING OUT THE INVENTION

[0017] Referring now to FIGS. **1** and **2**, there is shown a typical fire detector fabricated in accordance with a preferred embodiment of the present invention. The fire detector comprises a housing **100** accommodating therein a printed board **110** which mounts thereon integrated circuit chips **IC1, IC2, IC3, IC4,** and **IC5** respectively forming a smoke sensor unit **1**, a thermal sensor unit **2**, a signal processing unit **3**, a signal transmission unit **4**, and a power unit **5**. These units are prepared as common units for assembling various types of fire detectors, as will be discussed hereinafter. An optical guide **120** is also mounted on the printed board **110** to form an open bent path **122** for capturing an outside air with possible smoke particles. A light emitting diode (LED) **10** is disposed at one end of the path **122**, while a light receiving element such as a photo-diode **11** is disposed at the other end of the path **122** to receive a diffused light from the LED **10** through a prism **124** to flow a current of varying level indicative of a smoke density of the air. The current is then analyzed to determine an outbreak or presence of fire around the detector. The LED **10** and the photo-diode **11** may be incorporated in the chip **IC1** of the smoke sensor unit or may be mounted on or around the chip. Also, the path **122** may extend horizontally at an angle different from the illustrated one, and the LED **10** and photo-diode **11** may be arranged in a spatial relation differently than the illustrated example. A few elements or parts may be mounted on the printed board around the corresponding chip rather than being integrated in the chip. Such elements may include the LED **10**, photo-diode **11**, an oscillator such as a quartz oscillator, and an address memory such as EEPROM. Although few elements may be external to the corresponding chips, the input and output terminals for connection with the other unit or chip are concentrated on the chip so that the unit including the external element may be regarded as forming a single module in relation to the other unit. The printed board **110** is designed simply for interconnection of the units by wire bonding and can be therefore commonly utilized to var-

ious combinations of the units. Although each unit is preferred to be integrated into the chip or package, it may be realized on a discrete board or the like. Further, the input and output terminal of each unit may be arranged to form one or more sockets for interconnection with the corresponding unit by use of a complementary plug or cable.

[0018] FIG. 3 shows one type of the fire detector equipped with all the units, namely, the smoke sensor unit **1**, the thermal sensor unit **2**, the signal processing unit **3**, the signal transmission unit **4**, and the power unit **5**. The detector is wired together with the same or other types of detectors on a two-wire bus leading to a station receiver **6** which supervises the detectors regularly in order to check the fire-presence detected at the detector and gives a warning message for prompting a suitable cease-fire action. The units are deigned as multi-purpose units capable of being commonly utilized for various combinations of the units, or various types of the fire detector, as will be discussed hereinafter.

< Smoke Sensor Unit **1**>

[0019] The smoke sensor unit **1** includes, in addition to the LED **10** and the photo-diode **11**, an oscillator **12**, a controller **13**, an LED driver **14**, current-voltage converter **15**, a two-stage voltage amplifier **16** and **17**, a comparator **18** and an adjustor **19**. Further, the unit **1** has a power input terminal **T11** for receiving a DC voltage from the power unit **5**, an oscillation signal input terminal **T12**, a smoke density signal output terminal **T13**, and a fire-determination signal output terminal **T14**. The controller **13** receives an oscillation signal, i.e., clock signal either from the internal oscillator **12** or from an external oscillator **33** provided in the signal processing unit **3** through terminal **T12** to generate a LED timing signal by which the LED driver **14** activates LED **10** intermittently as well as a timing signal for intermittently energizing converter **15** and amplifier **16** and **17** in synchronous with the activation of LED **10**. In this example, the controller **13** utilizes the clock signal supplied from the signal processing unit **3** rather than from the internal oscillator **12** which is provided to give the oscillation signal to an internal terminal **T15** of controller **13** in case the external oscillator is not available. In this connection, the controller **13** has a function of selecting the internal oscillator **12** and the external oscillator manually or automatically. Although the intermittent activation or energization of the elements is preferred for saving energy consumption, the smoke sensor unit may be so designed to be constantly energized.

[0020] The current generated at the photo-diode **12** in proportion to the received light intensity is converted at the converter **15** into a voltage which is then amplified through amplifier **16** and **17** to provide a smoke density signal indicative of the sensed smoke density. The smoke density signal is fed through the terminal **T13** to the signal processing unit **3** for determination the fire-presence. The comparator **18** is provided to determine the fire-presence by comparing the voltage indicative of the smoke density with an internal threshold and to provide a fire-determination signal indicative of the fire-presence or not. In the illustrated instance where the fire-presence is determined at the signal processing unit **3**, the comparator **18** is not required to determine the fire-presence. However, when the signal processing unit **3** or external fire-presence determination function is not available as will be discussed in the following examples with reference to FIGS. 7 and 8, the comparator **18** is utilized to determine the fire-presence. For this purpose, the comparator **18** may have an additional function of being selectively activated depending upon the combinations of the units.

[0021] The adjustor **19** is provided to adjust a gain of the amplifier **17** as well as the threshold at the comparator **18**. The adjustor is therefore realized by a variable resistor which may be mechanical or electronically adjusting type, or even a resistor of which resistance is adjusted by a known laser trimming technique.

[0022] The LED **10** and the photo-diode **11** may be integrated to the chip **IC1** so that the entire unit **1** can be handled and mounted on the printed board as a single module.

<Thermal Sensor Unit **2**>

[0023] The thermal sensor unit **2** includes a temperature sensor **20** such as a thermistor for sensing an environmental temperature and generating a temperature signal indicative of the temperature. The thermal sensor unit **2** is connected to the power unit **5** and the signal processing unit **3** as illustrated. Thus, the thermistor **20** is energized by the DC voltage supplied from the power unit **5** through a power input terminal **T21** and provides the temperature signal through a temperature output terminal **T22** to the signal processing unit **3**.

<Signal Processing Unit **3**>

[0024] The signal processing unit **3** is prepared in the form of a molded package **IC3** which includes an A/D converter **30**, a logic circuit of an arithmetic processor **31**, an I/O processor **32**, and an oscillator **33**. The unit **3** is energized by the DC voltage received at a power input terminal **T31** connected to the power output terminal **T51** of the power unit **5**. The A/D converter **30** is connected to a smoke density input terminal **T33** and a temperature input terminal **T32** for receiving the smoke density signal from the smoke sensor unit **1** as well as the temperature signal from the thermal sensor unit **2**, and converts these signals into digital data which are analyzed in the arithmetic processor **31** to determine the fire-presence in accordance with a dedicated program. For example, the digital data are analyzed in comparison with predetermined thresholds and also in consideration of an aging effect on the optical system so as to

assure a reliable fire-presence determination while compensating for errors, such as a stray light effect due to a strain on the optical system. Upon determination of the fire-presence or not, the processor **31** generates a fire-determination signal which is fed through the I/O processor **32** to a fire-determination output terminal **T34**. The signal processing unit **3** is also provided with an interrogation signal input terminal **T35** for receiving an interrogation signal from the receiver **6** through the power unit **5** and the signal transmission unit **4**. In response to the interrogation signal, the processor **31** performs a routine of determining the fire-presence and sending back the fire-determination signal indicative of the fire-presence or not. The processing unit **3** includes the oscillator **33** which provides the oscillation signal or clock signal for operation of the signal processing unit **3**. The clock signal is also supplied to the smoke sensor unit **1** and to the signal transmission unit **4** respectively through oscillation signal output terminals **T36** and **T37**. Further, the arithmetic processor **31** may be designed to execute a sophisticated program, in answer to the interrogation signal, for analyzing the digital data of the smoke density and the temperature with respect to the time sequence to predict the outbreak of fire as well as to execute an error check routine for increased reliability of the fire-determination.

<Signal Transmission Unit **4**>

[0025] The signal transmission unit **4** includes a transmission interface **40**, an address memory **41**, and an oscillator **42**. The unit **4** is energized by the DC voltage received at a power input terminal **T41** connected to the power output terminal **T51** of the power unit **5**. The transmission interface **40** is connected to an oscillation signal input terminal **T47** for receiving the clock signal from the external oscillator **33** of the signal processing unit **3**, and to a fire-determination input terminal **T42** for receiving the fire-determination signal from the unit **3**. The interface **40**, which is a logic circuit, utilizes the clock signal to generate a multiplex signal carrying the fire-determination signal in conformity with an algorithm of the receiver **6**. The multiplex signal also carries an address of the fire detector fetched from the address memory **41**, for example, made of EEPROM or dip switch. The multiplex signal is transmitted through a multiplex signal output terminal **T46** to the receiver **6** where the multiplex signal is processed to see that the fire is detected at which fire detector. The address memory **41** may be alternatively provided in the signal processing unit **3**.

[0026] The interface **40** is also connected to an interrogation signal input terminal **T45** to receive the interrogation signal from the receiver **6** and transform it into a suitable format to be processed at the processor **31** in the signal processing unit **3**. Thus transformed interrogation signal is fed to an interrogation signal output terminal **T43** connected to the corresponding input terminal **T35** of the signal processing unit **3**. The oscillator **42** is reserved for providing the clock signal to the interface **40** in case the external oscillator **33** is not available as seen in another example shown in FIG. 7. Therefore, the interface **40** is given a function of selecting the internal oscillator **42** or the external oscillator either manually or automatically. Further, the signal transmission unit **4** is provided with an extra fire-determination input terminal **T44** which is reserved for connection with the corresponding output terminal **T14** of the smoke sensor unit **1** when the smoke sensor unit **1** is directly connected to the signal transmission unit **4** as in the example of in FIG. 7.

<Power Unit **5**>

[0027] The power unit **5** has a pair of ports **T52** and **T53** for connection with the receiver **6** through the two-wire bus **60**, and includes a non-polarization circuit **50** which allows non-polarized connection of the power unit **5** to the bus **60**. The circuit **50** is realized by a diode bridge and feeds a line voltage received from the bus to an internal power supply **51** which in turn provides the DC voltage to the power output terminal **T51** for energizing the other units **1** to **4**. Also included in the unit **5** is a signal transfer circuit **52** which is responsible for transmitting the fire-determination signal from the signal transmission unit **4** to the receiver **6** as well as the interrogation signal from the receiver **6** to the unit **4** respectively through a fire-determination input terminal **T56** and an interrogation signal output terminal **55**. The unit **5** additionally includes a switch circuit **53** which is capable of providing a short-circuit signal or low level voltage signal when the fire-determination signal received at a fire-determination input terminal **T54** indicates the fire-presence. In this example, the terminal **T54** is left open but is reserved for receiving the fire-determination signal not through the signal transmission unit **4**, as will be explained in other examples with reference to FIGS. 4, 8, and 10.

[0028] The non-polarized circuit **50** may be external to the corresponding chip **IC5** but is mounted on the printed board **110** immediately around the chip **IC5** as forming a single module of the power unit **5**. In this connection, it is noted that all the input and output terminals of each unit are concentrated on the corresponding IC chip. Whereby, the combination of the units can be made simply by bonding together the necessary terminals without requiring any intervening circuit forming parts or elements except for the printed board.

[0029] FIG. 4 shows a second example of the fire detector fabricated in accordance with the present invention which utilizes the smoke sensor unit **1**, the thermal sensor unit **2**, the signal processing unit **3**, and the power unit **5**. In this example, the output terminal **T34** of the signal processing unit **3** is connected to the input terminal **T54** of the power unit **5** so as to transmit the fire-determination signal from the unit **3** directly to the unit **5** so that the switch circuit **53** can respond to generate

the short-circuit signal, i.e., a low level voltage signal which is acknowledge by the receiver **6** as indicative of the fire-presence. The units are interconnected at the corresponding terminals as illustrated in FIG 4.

[0030] FIG. 5 shows a third example of the fire detector fabricated in accordance with the present invention which utilizes the smoke sensor unit **1**, the signal processing unit **3**, the signal transmission unit **4**, and the power unit **5**. This example is identical to the first example of FIG. 3 except that the thermal sensor unit **2** is omitted.

[0031] FIG. 6 shows a fourth example of the fire detector fabricated in accordance with the present invention which utilizes the smoke sensor unit **1**, the signal processing unit **3**, and the power unit **5**. This example is identical to the second example of FIG. 4 except that the thermal sensor unit **2** is omitted.

[0032] FIG. 7 shows a fifth example of the fire detector fabricated in accordance with the present invention which utilizes the smoke sensor unit **1**, the signal transmission unit **4**, and the power unit **5**. This example is identical to the third example of FIG. 5 except that the signal processing unit **3** is further omitted. In this example, the fire-determination output **T14** of the smoke sensor unit **1** is connected directly to the corresponding terminal **T44** of the unit **4** so that the fire-determination signal generated within the smoke sensor unit **1** is transmitted together with its address to the receiver **6**. The connection is bilateral so that the interrogation signal can be transmitted to the comparator **18** of the smoke sensor unit **1** from the receiver **6** through the power unit **5**. In this respect, the comparator **18** is given the same capability as in the processor **31** of the signal processing unit **3** for determination of the fire-presence in answer to the interrogation signal from the receiver **6**. Note that, due to the omission of the unit **3**, the oscillators **12** and **42** of the respective units **1** and **4** are made active to provide the oscillation signals for operation of the units.

[0033] FIG. 8 shows a sixth example of the fire detector fabricated in accordance with the present invention which utilizes the smoke sensor unit **1** and the power unit **5**. In this example, the fire-determination output terminal **T14** is connected directly to the corresponding input terminal **T54** of the power unit **5** so that the switch circuit **53** can generate the short-circuit signal in response to the fire-detection at the comparator **18** of the smoke sensor unit **1**. Also, in this example, the controller **13** of the smoke sensor unit **3** is caused to utilize the internal oscillator **12**. The comparator **18** is responsible for determination of the fire-presence based upon the sensed smoke density, but does not rely upon the extra function of answering the interrogation signal.

[0034] FIG. 9 shows a seventh example of the fire detector fabricated in accordance with the present invention which utilizes the thermal sensor unit **2**, the signal processing unit **3**, the signal transmission unit **4**, and the power unit **5**. This example is identical to the first example except for omission of the smoke sensor unit **1**. Thus, the fire-determination is made based only upon the temperature.

[0035] FIG. 10 shows an eighth example of the fire detector fabricated in accordance with the present invention which utilizes the thermal sensor unit **2**, the signal processing unit **3**, and the power unit **5**. In this example, the fire-determination output terminal **T34** is connected directly to the corresponding input terminal **T14** of the power unit **5** to transmit the fire-determination signal to the switch circuit **18**. Thus, when the fire-determination signal indicates the fire-presence, the switch circuit **18** generates the short-circuit signal by which the receiver **6** acknowledges the fire-presence.

[0036] FIG. 11 shows another example in which the smoke sensing unit **1** can be singly applied to a system for removing the smoke particles. In this system, the smoke sensing unit **1** is connected to a receiver device **7** such as air cleaner having a smoke particle trapping filter or a ventilator exhausting the smoke particle born air. The receiver device **7** is designed to supply the DC voltage to the power input terminal **T11** of the smoke sensor unit **1** and receive the smoke density signal therefrom. Also, the device **7** includes a processor which determines degree of pollution based upon the sensed smoke density and activates a suitable mechanism for removing the some particles.

[0037] In the foregoing description, the connections between the terminals should be recognized with reference to the corresponding drawings when not specified.

Claims

1. Method for fabricating a fire detector utilizing:

   - a smoke sensor unit which generates a smoke density signal indicative of a sensed smoke density as well as determines the fire-presence or not based upon the sensed smoke density to generate a fire-determination signal indicative of the determination, said smoke sensor unit having

     - a power input terminal for receiving an operating voltage,
     - a smoke density output terminal for providing said smoke density signal, and
     - a fire-determination output terminal for providing said fire-determination signal;

   - a thermal sensor unit which senses an environmental temperature to generate a temperature signal indicative thereof, said thermal sensor unit having

     - a power input terminal for receiving the operating voltage, and
     - a temperature output terminal for providing

said temperature signal;

- a signal processing unit which determines the fire-presence or not based upon one of said smoke density signal and said temperature signal and generates a fire-determination signal indicative of the determination, said signal processing unit having:
  - a smoke density input terminal for receiving said smoke density signal,
  - a temperature input terminal for receiving said temperature signal,
  - a power input terminal for receiving the operating voltage,
  - a fire-determination output terminal for providing the fire-determination signal, and
  - an interrogation signal input terminal for receiving an interrogation signal;
- a power unit providing said operating voltage, said power unit including a switch circuit which is adapted to be connected to a receiver for providing a short-circuit signal in accordance with said fire-determination signal, said power unit further including a transfer circuit which transfers an interrogation signal from the receiver to a signal transmission unit as well as a multiplex signal from said signal transmission unit to the receiver, said power unit having:
  - a power output terminal for providing said operating voltage,
  - a multiplex signal input terminal for receiving said multiplex signal,
  - an interrogation output terminal for providing said interrogation signal,
  - a fire-determination input terminal for receiving said fire-presence signal, and
  - a port for connection with the receiver,

said method comprising combining said power unit with at least said smoke sensor unit or combining said power unit with at least said thermal sensor unit and said signal processing unit.

2. Method for fabricating a fire detector according to claim 1, additionally utilizing:

- a signal transmission unit adapted to be connected to a receiver and converting said fire-determination signal into a multiplex signal for multiplex transmission to said receiver, said signal transmission unit transforming the interrogation signal from said receiver into a suitable format to be processed at said signal processing unit, said signal transmission unit having:
  - a power input terminal for receiving the operating voltage,
  - an interrogation input terminal for receiving said interrogation signal,
  - a fire-determination input terminal for receiving said fire-determination signal,
  - an interrogation signal output terminal for transmitting said interrogation signal, and
  - a multiplex signal output terminal for transmitting said multiplex signal;

said method comprising combining said power unit with at least said smoke sensor or combining said power unit with at least said thermal sensor and said signal processing unit and additionally with at least said signal transmission unit.

3. Method according to claim 1 or 2, wherein at least one of said smoke sensor unit, said thermal sensor unit, said signal processing unit, said signal transmission unit, and said power unit is realized into an integrated circuit.

4. A fire detector fabricated in accordance with a method according to one of the claims 1 to 3, comprising at least

- a power unit providing said operating voltage, said power unit including a switch circuit which is adapted to be connected to a receiver for providing a short-circuit signal in accordance with said fire-determination signal, said power unit further including a transfer circuit which transfers an interrogation signal from the receiver to a signal transmission unit as well as a multiplex signal from said signal transmission unit to the receiver, said power unit having:
  - a power output terminal for providing said operating voltage,
  - a multiplex signal input terminal for receiving said multiplex signal,
  - an interrogation output terminal for providing said interrogation signal,
  - a fire-determination input terminal for receiving said fire-presence signal, and
  - a port for connection with the receiver,

in combination with

- a smoke sensor unit which generates a smoke density signal indicative of a sensed smoke density as well as determines the fire-presence or not based upon the sensed smoke density to generate a fire-determination signal indicative of the determination, said smoke sensor unit having

- a power input terminal for receiving an operating voltage,
- a smoke density output terminal for providing said smoke density signal, and
- a fire-determination output terminal for providing said fire-determination signal;

or in combination with

- a thermal sensor unit which senses an environmental temperature to generate a temperature signal indicative thereof, said thermal sensor unit having

  - a power input terminal for receiving the operating voltage, and
  - a temperature output terminal for providing said temperature signal; and

- a signal processing unit which determines the fire-presence or not based upon one of said smoke density signal and said temperature signal and generates a fire-determination signal indicative of the determination, said signal processing unit having:

  - a smoke density input terminal for receiving said smoke density signal,
  - a temperature input terminal for receiving said temperature signal,
  - a power input terminal for receiving the operating voltage,
  - a fire-determination output terminal for providing the fire-determination signal, and
  - an interrogation signal input terminal for receiving an interrogation signal

5. A fire detector according to claim 4, wherein

- said fire detector is equipped with said smoke sensor unit, said thermal sensor unit, said signal processing unit, said signal transmission unit, and said power unit,
- said smoke sensor unit having said smoke density output terminal conneted to said smoke density input terminal of said signal processing unit,
- said thermal sensor unit having said temperature output terminal connected to said temperature input terminal of said signal processing unit,
- said signal processing unit having said fire-determination output terminal connected to said fire-determination input terminal of said signal transmission unit,
- said signal processing unit having said interrogation input terminal connected to said interrogation output terminal of said signal transmission unit,
- said signal transmission unit having said multiplex signal output terminal connected to said multiplex signal input terminal of said power unit,
- said signal transmission unit having said interrogation input terminal connected to said interrogation output terminal of said power unit,
- said power unit having said power output terminal connected to said power input terminals of said smoke sensor unit, said thermal sensor unit, said signal processing unit, and said signal transmission unit.

6. A fire detector according to claim 4, wherein

- said fire detector is equipped with said smoke sensor unit, said thermal sensor unit, said signal processing unit, and said power unit,
- said smoke sensor unit having said smoke density output terminal connected to said smoke density input terminal of said signal processing unit,
- said thermal sensor unit having said temperature output terminal connected to said temperature input terminal of said signal processing unit,
- said signal processing unit having said fire-determination output terminal connected to said fire-determination input terminal of said power unit,
- said power unit having said power output terminal connected to said power input terminals of said smoke sensor unit, said thermal sensor unit, and said signal processing unit.

7. A fire detector according to claim 4, wherein

- said fire detector is equipped with said smoke sensor unit, said signal processing unit, said signal transmission unit, and said power unit,
- said smoke sensor unit having said smoke density output terminal connected to said smoke density input terminal of said signal processing unit,
- said signal processing unit having said fire-determination output terminal connected to said fire-determination input terminal of said signal transmission unit,
- said signal processing unit having said interrogation input terminal connected to said interrogation output terminal of said signal transmission unit,
- said signal transmission unit having said multiplex signal output terminal connected to said multiplex signal input terminal of said power unit,
- said signal transmission unit having said inter-

rogation input terminal connected to said interrogation output terminal of said power unit,
- said power unit having said power output terminal connected to said power input terminals of said smoke sensor unit, said signal processing unit, and said signal transmission unit.

8. A fire detector according to claim 4, wherein

- said fire detector is equipped with said smoke sensor unit, said signal processing unit, and said power unit,
- said smoke sensor unit having said smoke density output terminal connected to said smoke density input terminal of said signal processing unit,
- said signal processing unit having said fire-determination output terminal connected to said fire-determination input terminal of said power unit,
- said power unit having said power output terminal connected to said power input terminals of said smoke sensor unit and said signal processing unit.

9. A fire detector according to claim 4, wherein

- said fire detector is equipped with said smoke sensor unit, said signal transmission unit, and said power unit,
- said smoke sensor unit having said fire-determination output terminal connected to said fire-determination input terminal of said signal transmission unit,
- said signal transmission unit having said multiplex signal output connected to said multiplex signal input of said power unit,
- said power unit having said power output terminal connected to said power input terminals of said smoke sensor unit and said signal transmission unit.

10. A fire detector according to claim 4, wherein

- said fire detector is equipped with said smoke sensor unit and said power unit,
- said smoke sensor unit having said fire-determination output terminal connected to said fire-determination input terminal of said power unit,
- said power unit having said power output terminal connected to said power input terminal of said smoke sensor unit.

11. A fire detector according to claim 4, wherein

- said fire detector is equipped with said thermal sensor unit, said signal processing unit, said signal transmission unit, and said power unit,
- said thermal sensor unit having said temperature output terminal connected to said temperature input terminal of said signal processing unit,
- said signal processing unit having said fire-determination output terminal connected to said fire-determination input terminal of said signal transmission unit,
- said signal processing unit having said interrogation input terminal connected to said interrogation output terminal of said signal transmission unit,
- said signal transmission unit having said multiplex signal output terminal connected to said multiplex signal input of said power unit,
- said signal transmission unit having said interrogation input terminal connected to said interrogation output terminal of said power unit,
- said power unit having said power output terminal connected to said power input terminals of said thermal sensor unit, said signal processing unit, and said signal transmission unit.

12. A fire detector according to claim 4, wherein

- said fire detector is equipped with said thermal sensor unit, said signal processing unit, and said power unit,
- said thermal sensor unit having said temperature output terminal connected to said temperature input terminal of said signal processing unit,
- said signal processing unit having said fire-determination output terminal connected to said fire-determination input terminal of said power unit,
- said power unit having said power output terminal connected to said power input terminals of said thermal sensor unit and said signal processing unit.

Patentansprüche

1. Verfahren zum Herstellen eines Feuerdetektors, das folgende Elemente verwendet:

- eine Rauchsensoreinheit, die ein Rauchdichtesignal erzeugt, das eine nachgewiesene Rauchdichte angibt, sowie basierend auf der nachgewiesenen Rauchdichte bestimmt, ob Feuer vorhanden ist oder nicht, so daß ein Feuerbestimmungssignal erzeugt wird, das diese Bestimmung angibt, wobei die Rauchsensoreinheit folgendes aufweist:

  - einen Leistungseingangsanschluß zur Aufnahme einer Betriebsspannung;

- einen Rauchdichteausgangsanschluß zum Bereitstellen des Rauchdichtesignals, und
- einen Feuerbestimmungsausgangsanschluß zum Bereitstellen des Feuerbestimmungssignals;

- eine thermische Sensoreinheit, die eine Umgebungstemperatur prüft, um ein Temperatursignal zu erzeugen, das diese angibt, wobei die thermische Sensoreinheit folgende Elemente umfaßt:

  - einen Leistungseingangsanschluß zur Aufnahme der Betriebsspannung, und
  - einen Temperaturausgangsanschluß zum Bereitstellen des Temperatursignals;

- eine Signalverarbeitungseinheit, die bestimmt, ob Feuer vorhanden ist oder nicht, in Abhängigkeit entweder von dem Rauchdichtesignal oder dem Temperatursignal, und die ein Feuerbestimmungssignal erzeugt, das diese Bestimmung angibt, wobei die Signalverarbeitungseinheit folgende Elemente aufweist:

  - einen Rauchdichteeingangsanschluß zum Empfangen des Rauchdichtesignals,
  - einen Temperatureingangsanschluß zum Empfangen des Temperatursignals,
  - einen Leistungseingangsanschluß zur Aufnahme der Betriebsspannung,
  - einen Feuerbestimmungsausgangsanschluß zum Bereitstellen des Feuerbestimmungssignals, und
  - einen Unterbrechungssignaleingangsanschluß zum Empfangen eines Unterbrechungssignals;

- eine Energieversorgungseinheit, die die Betriebsspannung zur Verfügung stellt, wobei die Energieversorgungseinheit einen Schaltkreis zum Schalten umfaßt, der so ausgelegt ist, daß er zum Bereitstellen eines Kurzschluß-Signals in Übereinstimmung mit dem Feuerbestimmungssignal mit einem Empfänger verbunden ist, wobei die Energieversorgungseinheit ferner einen Übertragungsschaltkreis umfaßt, der ein Unterbrechungssignal von dem Empfänger zu einer Signalübertragungseinheit sowie ein Multiplex-Signal von der Übertragungseinheit zu dem Empfänger überträgt, wobei die Energieversorgungseinheit folgende Elemente umfaßt:

  - einen Leistungsausgangsanschluß zum Bereitstellen der Betriebsspannung,
  - einen Multiplex-Signaleingangsanschluß zum Empfangen des Multiplex-Signals,
  - einen Unterbrechungsausgangsanschluß zum Bereitstellen des Unterbrechungssignals,
  - einen Feuerbestimmungseingangsanschluß zum Empfangen des Feueranwesenheitssignals, und
  - einen Anschluß für eine Verbindung mit dem Empfänger,

wobei das Verfahren ein Kombinieren der Energieversorgungseinheit wenigstens mit der Rauchsensoreinheit oder ein Kombinieren der Energieversorgungseinheit wenigstens mit der thermischen Sensoreinheit und der Signalverarbeitungseinheit umfaßt.

2. Verfahren zum Herstellen eines Feuerdetektors gemäß Anspruch 1, der zusätzlich folgendes umfaßt:

- eine Signalübertragungseinheit, die so ausgelegt ist, daß sie mit einem Empfänger verbunden ist und das Feuerbestimmungssignal in ein Multiplex-Signal für eine Multiplex-Übertragung zu dem Empfänger umwandelt, wobei die Signalübertragungseinheit das Unterbrechungssignal von dem Empfänger in ein geeignetes Format transformiert, so daß es an der Signalverarbeitungseinheit verarbeitet werden kann, wobei die Signalübertragungseinheit folgendes umfaßt:

  - einen Leistungseingangsanschluß zum Empfangen der Betriebsspannung,
  - einen Unterbrechungseingangsanschluß zum Empfangen des Unterbrechungssignals,
  - einen Feuerbestimmungseingangsanschluß zum Empfangen des Feuerbestimmungssignals,
  - einen Unterbrechungssignalausgangsanschluß zum Übertragen des Unterbrechungssignals, und
  - einen Multiplex-Signalausgangsanschluß zum Übertragen des Multiplex-Signals;

wobei das Verfahren ein Kombinieren der Energieversorgungseinheit wenigstens mit dem Rauchsensor oder ein Kombinieren der Energieversorgungseinheit wenigstens mit dem thermischen Sensor und der Signalverarbeitungseinheit und zusätzlich wenigstens mit der Signalübertragungseinheit umfaßt.

3. Verfahren nach Anspruch 1 oder 2, wobei die Rauchsensoreinheit, die thermische Sensoreinheit, die Signalverarbeitungseinheit, die Signalübertragungseinheit und/oder die Energieversorgungseinheit mittels eines integrierten Schaltkrei-

ses realisiert sind.

4. Feuerdetektor, der gemäß einem Verfahren nach einem der Ansprüche 1 bis 3 hergestellt ist, der wenigstens folgende Elemente umfaßt:

- eine Energieversorgungseinheit, die die Betriebsspannung zur Verfügung stellt, wobei die Energieversorgungseinheit einen Schaltkreis zum Schalten umfaßt, der so ausgelegt ist, daß er zum Bereitstellen eines Kurzschlußsignals in Übereinstimmung mit dem Feuerbestimmungssignal mit einem Empfänger verbunden werden kann, wobei die Energieversorgungseinheit ferner einen Übertragungsschaltkreis umfaßt, der ein Unterbrechungssignal von dem Empfänger zu einer Signalübertragungseinheit überträgt sowie ein Multiplex-Signal von der Signalübertragungseinheit zu dem Empfänger überträgt, wobei die Energieversorgungseinheit umfaßt:
  - einen Leistungsausgangsanschluß zum Bereitstellen der Betriebsspannung,
  - einen Multiplex-Signaleingangsanschluß zum Empfangen des Multiplex-Signals,
  - einen Unterbrechungsausgangsanschluß zum Bereitstellen des Unterbrechungssignals,
  - einen Feuerbestimmungseingansanschluß zum Empfangen des Feueranwesenheitssignals, und
  - einen Anschluß zum Verbinden mit dem Empfänger,

in Kombination mit:

- einer Rauchsensoreinheit, die ein Rauchdichtesignal erzeugt, das eine nachgewiesene Rauchdichte angibt und auch bestimmt, ob ein Feuer vorhanden ist oder nicht, in Abhängigkeit von der nachgewiesenen Rauchdichte, um ein Feuerbestimmungssignal zu erzeugen, das diese Bestimmung angibt, wobei die Rauchsensoreinheit umfaßt:
  - einen Leistungseingangsanschluß zum Empfangen einer Betriebsspannung,
  - einen Rauchdichteausgangsanschluß zum Bereitstellen des Rauchdichtesignals, und
  - einen Feuerbestimmungsausgangsanschluß zum Bereitstellen des Feuerbestimmungssignals;

oder in Kombination mit

- einer thermischen Sensoreinheit, die eine Umgebungstemperatur prüft, um ein Temperatursignal zu erzeugen, das diese angibt, wobei die thermische Sensoreinheit umfaßt:
  - einen Leistungseingangsanschluß zur Aufnahme der Betriebsspannung; und
  - einen Temperaturausgangsanschluß zum Bereitstellen des Temperatursignals; und
- einer Signalverarbeitungseinheit, die bestimmt, ob ein Feuer vorhanden ist oder nicht, abhängig entweder von dem Rauchdichtesignal oder dem Temperatursignal, und welche ein Feuerbestimmungssignal erzeugt, das die Bestimmung angibt, wobei die Signalverarbeitungseinheit umfaßt:
  - einen Rauchdichteeingangsanschluß zum Empfangen des Rauchdichtesignals,
  - einen Temperatureingangsanschluß zum Empfangen des Temperatursignals,
  - einen Leistungseingangsanschluß zur Aufnahme der Betriebsspannung,
  - einen Feuerbestimmungsausgangsanschluß zum Bereitstellen des Feuerbestimmungssignals; und
  - einen Unterbrechungssignaleingangsanschluß zum Empfangen eines Unterbrechungssignals.

5. Feuerdetektor nach Anspruch 4, wobei

- der Feuerdetektor mit der Rauchsensoreinheit, der thermischen Sensoreinheit, der Signalprozessoreinheit, der Signalübertragungseinheit und der Energieversorungseinheit ausgestattet ist, wobei
- bei der Rauchsensoreinheit der Rauchdichteausgangsanschluß mit dem Rauchdichteeingangsanschluß der Signalverarbeitungseinheit verbunden ist,
- bei der thermischen Sensoreinheit der Temperaturausgangsanschluß mit dem Temperatureingangsanschluß der Signalverarbeitungseinheit verbunden ist,
- bei der Signalverarbeitungseinheit der Feuerbestimmungsausgangsanschluß mit dem Feuerbestimmungseingangsanschluß der Signalübertragungseinheit verbunden ist,
- bei der Signalverarbeitungseinheit der Unterbrechungseingangsanschluß mit dem Unterbrechungsausgangsanschluß der Signalübertragungseinheit verbunden ist,
- bei der Signalübertragungseinheit der Multiplex-Signalausgangsanschluß mit dem Multiplex-Signaleingangsanschluß der Energieversorgungseinheit verbunden ist.
- bei der Signalübertragungseinheit der Unter-

brechungseingangsanschluß mit dem Unterbrechungsausgangsanschluß der Energieversorgungseinheit verbunden ist,

- bei der Energieversorgungseinheit der Leistungsausgangsanschluß mit den Leistungseingangsanschlüssen der Rauchsensoreinheit, der thermischen Sensoreinheit, der Signalverarbeitungseinheit und der Signalübertragungseinheit verbunden ist.

6. Feuerdetektor nach Anspruch 4, wobei

- der Feuerdetektor mit der Rauchsensoreinheit, der thermischen Sensoreinheit, der Signalverarbeitungseinheit und der Energieversorgungseinheit ausgestattet ist, wobei
- bei der Rauchsensoreinheit der Rauchdichteausgangsanschluß mit dem Rauchdichteeingangsanschluß der Signalverarbeitungseinheit verbunden ist,
- bei der thermischen Sensoreinheit der Temperaturausgangsanschluß mit dem Temperatureingangsanschluß der Signalverarbeitungseinheit verbunden ist,
- bei der Signalverarbeitungseinheit der Feuerbestimmungsausgangsanschluß mit dem Feuerbestimmungseingangsanschluß der Energieversorgungseinheit verbunden ist,
- bei der Energieversorgungseinheit der Leistungsausgangsanschluß mit den Leistungseingangsanschlüssen der Rauchsensoreinheit, der thermischen Sensoreinheit und der Signalverarbeitungseinheit verbunden ist.

7. Feuerdetektor nach Anspruch 4, wobei

- der Feuerdetektor mit der Rauchsensoreinheit, der Signalverarbeitungseinheit, der Signalübertragungseinheit und der Energieversorgungseinheit verbunden ist, wobei
- bei der Rauchsensoreinheit der Rauchsensorausgangsanschluß mit dem Rauchsensoreingangsanschluß der Signalverarbeitungseinheit verbunden ist,
- bei der Signalverarbeitungseinheit der Feuerbestimmungsausgangsanschluß mit dem Feuerbestimmungseingangsanschluß der Signalübertragungseinheit verbunden ist,
- bei der Signalverarbeitungseinheit der Unterbrechungseingangsanschluß mit dem Unterbrechungsausgangsanschluß der Signalübertragungseinheit verbunden ist,
- bei der Signalübertragungseinheit der Multiplex-Signalausgangsanschluß mit dem Multiplex-Signaleingangsanschluß der Energieversorgungseinheit verbunden ist,
- bei der Signalübertragungseinheit der Unterbrechungseingangsanschluß mit dem Unterbrechungsausgangsanschluß der Energieversorgungseinheit verbunden ist,
- bei der Energieversorgungseinheit der Leistungsausgangsanschluß mit den Leistungseingangsanschlüssen der Rauchsensoreinheit, der Signalverarbeitungseinheit und der Signalübertragungseinheit verbunden ist.

8. Feuerdetektor nach Anspruch 4, wobei

- der Feuerdetektor mit der Rauchsensoreinheit, der Signalverarbeitungseinheit und der Energieversorgungseinheit ausgestattet ist, wobei
- bei der Rauchsensoreinheit der Rauchdichteausgangsanschluß mit dem Rauchdichteeingangsanschluß der Signalverarbeitungseinheit verbunden ist,
- bei der Signalverarbeitungseinheit der Feuerbestimmungsausgangsanschluß mit dem Feuerbestimmungseingangsanschluß der Energieversorgungseinheit verbunden ist,
- bei der Energieversorgungseinheit der Leistungsausgangsanschluß mit den Leistungseingangsanschlüssen der Rauchsensoreinheit und der Signalverarbeitungseinheit verbunden ist.

9. Feuerdetektor nach Anspruch 4, wobei

- der Feuerdetektor mit der Rauchsensoreinheit, der Signalübertragungseinheit und der Energieversorgungseinheit ausgestattet ist, wobei
- bei der Rauchsensoreinheit der Feuerbestimmungsausgangsanschluß mit dem Feuerbestimmungseingangsanschluß der Signalübertragungseinheit verbunden ist,
- bei der Signalübertragungseinheit der Multiplex-Signalausgangsanschluß mit dem Multiplex-Signaleingang der Energieversorgungseinheit verbunden ist,
- bei der Energieversorgungseinheit der Leistungsausgangsanschluß mit den Leistungseingangsanschlüssen der Rauchsensoreinheit und der Signalübertragungseinheit verbunden ist.

10. Feuerdetektor nach Anspruch 4, wobei

- der Feuerdetektor mit der Rauchsensoreinheit und der Energieversorgungseinheit ausgestattet ist, wobei
- bei der Rauchsensoreinheit der Feuerbestimmungsausgangsanschluß mit dem Feuerbestimmungseingangsanschluß der Energieversorgungseinheit verbunden ist,
- bei der Energieversorgungseinheit der Leistungsausgangsanschluß mit dem Leistungseingangsanschluß der Rauchsensoreinheit

verbunden ist.

11. Feuerdetektor nach Anspruch 4, wobei

- der Feuerdetektor mit der thermischen Sensoreinheit, der Signalverarbeitungseinheit, der Signalübertragungseinheit und der Energieversorgungseinheit ausgestattet ist, wobei
- bei der thermischen Sensoreinheit der Temperaturausgangsanschluß mit dem Temperatureingangsanschluß der Signalverarbeitungseinheit verbunden ist,
- bei der Signalverarbeitungseinheit der Feuerbestimmungsausgangsanschluß mit dem Feuerbestimmungseingangsanschluß der Signalübertragungseinheit verbunden ist,
- bei der Signalverarbeitungseinheit der Unterbrechungseingangsanschluß mit dem Unterbrechungsausgangsanschluß der Signalübertragungseinheit verbunden ist,
- bei der Signalübertragungseinheit der Multiplex-Signalausgangsanschluß mit dem Multiplex-Signaleingangsanschluß der Energieversorgungseinheit verbunden ist,
- bei der Signalübertragungseinheit der Unterbrechungseingangsanschluß mit dem Unterbrechungsausgangsanschluß der Energieversorgungseinheit verbunden ist,
- bei der Energieversorgungseinheit der Leistungsausgangsanschluß mit den Leistungseingangsanschlüssen der thermischen Sensoreinheit, der Signalverarbeitungseinheit und der Signalübertragungseinheit verbunden ist.

12. Feuerdetektor nach Anspruch 4, wobei

- der Feuerdetektor mit der thermischen Sensoreinheit, der Signalverarbeitungseinheit und der Energieversorgungseinheit ausgestattet ist, wobei
- bei der thermischen Sensoreinheit der Temperaturausgangsanschluß mit dem Temperatureingangsanschluß der Signalverarbeitungseinheit verbunden ist,
- bei der Signalverarbeitungseinheit der Feuerbestimmungsausgangsanschluß mit dem Feuerbestimmungseingangsanschluß der Energieversorgungseinheit verbunden ist, und
- bei der Energieversorgungseinheit der Leistungsausgangsanschluß mit den Leistungseingangsanschlüssen der thermischen Sensoreinheit und der Signalverarbeitungseinheit verbunden ist.

Revendications

1. Procédé de fabrication d'un détecteur d'incendie mettant en oeuvre :

- une unité de détection de fumée qui génère un signal de densité de fumée indicatif d'une densité de fumée détectée et qui détermine également la présence de fumée ou non en se basant sur la densité de fumée détectée pour générer un signal de détermination de fumée indicatif de la détermination, ladite unité de détection de fumeur comportant
  - une borne d'entrée d'alimentation qui reçoit une tension de fonctionnement,
  - une borne de sortie de densité de fumée qui fournit ledit signal de densité de fumée, et
  - une borne de sortie de détermination de fumée qui fournit ledit signal de détermination de fumée ;
- une unité à capteur thermique qui capte une température environnementale pour générer un signal de température indicatif de celle-ci, ladite unité à capteur thermique comportant
  - une borne d'entrée d'alimentation qui reçoit la tension de fonctionnement, et
  - une borne de sortie de température qui fournit ledit signal de température ;
- une unité de traitement du signal qui détermine la présence de fumée ou non en se basant sur un dudit signal de densité de fumée et dudit signal de température et génère un signal de détermination de fumée indicatif de la détermination, ladite unité de traitement du signal comportant :
  - une borne d'entrée de densité de fumée qui reçoit ledit signal de densité de fumée,
  - une borne d'entrée de température qui reçoit ledit signal de température,
  - une borne d'entrée d'alimentation qui reçoit la tension de fonctionnement,
  - une borne de sortie de détermination de fumée qui fournit le signal de détermination de fumée, et
  - une borne d'entrée de signal d'interrogation qui reçoit un signal d'interrogation ;
- une unité d'alimentation fournissant ladite ten-

sion de fonctionnement, ladite unité d'alimentation comprenant un circuit de commutation qui est adapté pour être connecté à un récepteur afin de fournir un signal de court-circuit conformément audit signal de détermination de fumée, ladite unité d'alimentation comprenant en outre un circuit de transfert qui transfère un signal d'interrogation du récepteur à l'unité de transmission du signal ainsi qu'un signal multiplexé de ladite unité de transmission du signal au récepteur, ladite unité d'alimentation comportant

- une borne d'entrée d'alimentation qui fournit ladite tension de fonctionnement,
- une borne de sortie de signal multiplexé qui reçoit ledit signal multiplexé,
- une borne de sortie d'interrogation qui fournit ledit signal d'interrogation,
- une borne d'entrée de détermination de fumée qui reçoit ledit signal de présence de fumée, et
- un port pour la connexion avec le récepteur,

ledit procédé comprenant la combinaison de ladite unité d'alimentation avec au moins ladite unité de détection de fumée ou la combinaison de ladite unité d'alimentation avec au moins ladite unité à capteur thermique et ladite unité de traitement du signal.

2. Procédé pour fabriquer un détecteur d'incendie selon la revendication 1, utilisant en outre :

- une unité de transmission de signal adaptée pour être connectée à un récepteur et convertir ledit signal de détermination de fumée en un signal multiplexé pour la transmission multiplexée audit récepteur, ladite unité de transmission du signal transformant le signal d'interrogation dudit récepteur en un format approprié pour être traité au niveau de ladite unité de traitement du signal, ladite unité de transmission du signal comportant :
  - une borne d'entrée d'alimentation qui reçoit la tension de fonctionnement,
  - une borne d'entrée d'interrogation qui reçoit ledit signal d'interrogation,
  - une borne d'entrée de détermination de fumée qui reçoit ledit signal de détermination de fumée,
  - une borne de sortie de signal d'interrogation qui transmet ledit signal d'interrogation, et
  - une borne de sortie de signal multiplexé pour transmettre ledit signal multiplexé ;

ledit procédé comprenant la combinaison de ladite unité d'alimentation avec au moins ledit détecteur de fumée ou la combinaison de ladite alimentation avec au moins ledit capteur thermique et ladite unité de traitement du signal et en outre avec au moins ladite unité de transmission du signal.

3. Procédé selon la revendication 1 ou 2, dans lequel au moins une de ladite unité de détection de fumée, ladite unité à capteur thermique, ladite unité de traitement du signal, ladite unité de transmission du signal et ladite unité d'alimentation est réalisée dans un circuit intégré.

4. Détecteur d'incendie fabriqué conformément à un procédé selon l'une quelconque des revendications 1 à 3, comprenant au moins

- une unité d'alimentation fournissant ladite tension de fonctionnement, ladite unité d'alimentation comprenant un circuit de commutation qui est adapté pour être connecté à un récepteur afin de fournir un signal de court-circuit conformément audit signal de détermination de fumée, ladite unité d'alimentation comprenant en outre un circuit de transfert qui transfère un signal d'interrogation du récepteur à une unité de transmission du signal ainsi qu'un signal multiplexé de ladite unité de transmission du signal au récepteur, ladite unité d'alimentation comportant :
  - une borne de sortie d'alimentation qui fournit ladite tension de fonctionnement,
  - une borne d'entrée de signal multiplexé qui reçoit ledit signal multiplexé,
  - une borne de sortie d'interrogation qui fournit ledit signal d'interrogation,
  - une borne d'entrée de détermination de fumée qui reçoit ledit signal de présence de fumée, et
  - un port pour la connexion avec le récepteur,

en combinaison avec

- une unité de détection de fumée qui génère un signal de densité de fumée indicatif d'une densité de fumée détectée et qui détermine également la présence de fumée ou non en se basant sur la densité de fumée détectée pour générer un signal de détermination de fumée indicatif de la détermination, ladite unité de détection de fumée comportant

  - une borne d'entrée d'alimentation qui reçoit une tension de fonctionnement,

  - une borne de sortie de densité de fumée qui fournit ledit signal de densité de fumée,

  - une borne de sortie de détermination de fumée qui fourni ledit signal de détermination de fumée ; et

ou en combinaison avec

- une unité à capteur thermique qui capte une température environnementale pour générer un signal de température indicatif de celle-ci, ladite unité de capteur thermique comportant

  - une borne d'entrée d'alimentation qui reçoit la tension de fonctionnement, et

  - une borne de sortie de température qui fournit ledit signal de température ; et

- une unité de traitement du signal qui détermine la présence de fumée ou non en se basant sur un dudit signal de densité de fumée et dudit signal de température et génère un signal de détermination de fumée indicatif de la détermination, ladite unité de traitement du signal comportant :

  - une borne d'entrée de densité de fumée qui reçoit ledit signal de densité de fumée,

  - une borne d'entrée de température qui reçoit ledit signal de température,

  - une borne d'entrée d'alimentation qui reçoit la tension de fonctionnement,

  - une borne de sortie de détermination de fumée qui fournit le signal de détermination de fumée, et

  - une borne d'entrée de signal d'interrogation qui reçoit un signal d'interrogation.

5. Détecteur d'incendie selon la revendication 4, dans lequel

- ledit détecteur d'incendie est équipé de ladite unité de détection de fumée, ladite unité à capteur thermique, ladite unité de traitement du signal, ladite unité de transmission du signal, ladite unité d'alimentation,

- ladite unité de détection de fumée ayant ladite borne de sortie de densité de fumée connectée à ladite borne d'entrée de densité de fumée de ladite unité de traitement du signal,

- ladite unité à capteur thermique ayant ladite borne de sortie de température connectée à ladite borne d'entrée de température de ladite unité de traitement du signal,

- ladite unité de traitement du signal ayant ladite borne de sortie de détermination de fumée connectée à ladite borne d'entrée de détermination de fumée de ladite unité de transmission du signal,

- ladite unité de traitement du signal ayant ladite borne d'entrée d'interrogation connectée à ladite borne de sortie d'interrogation de ladite unité de transmission du signal,

- ladite unité de transmission du signal ayant ladite borne de sortie de signal multiplexé connectée à ladite borne d'entrée de signal multiplexé de ladite unité d'alimentation,

- ladite unité de transmission du signal ayant ladite borne d'entrée d'interrogation connectée à ladite borne de sortie d'interrogation de la dite unité d'alimentation,

- ladite unité d'alimentation ayant ladite borne de sortie d'alimentation connectée audites bornes d'entrée d'alimentation de ladite unité de détection de fumée, ladite unité à capteur thermique, ladite unité de traitement de signal et ladite unité de transmission de signal.

6. Détecteur d'incendie selon la revendication 4, dans lequel

- ledit détecteur d'incendie est équipé de ladite unité de détection de fumée, ladite unité à capteur thermique, ladite unité de traitement du signal et ladite unité d'alimentation,

- ladite unité de détection de fumée ayant ladite borne de sortie de densité de fumée connectée à ladite borne d'entrée de densité de fumée de ladite unité de traitement du signal,

- ladite unité à capteur thermique ayant ladite

borne de sortie de température connectée à ladite borne d'entrée de température de ladite unité de traitement du signal,

- ladite unité de traitement du signal ayant ladite borne de sortie de détermination de fumée connectée à ladite borne d'entrée de détermination de fumée de ladite unité d'alimentation,

- ladite unité d'alimentation ayant ladite borne de sortie d'alimentation connectée audites bornes d'entrée d'alimentation de ladite unité de détection de fumée, ladite unité àcapteur thermique et ladite unité de traitement du signal.

7. Détecteur d'incendie selon la revendication 4, dans lequel

- ledit détecteur d'incendie est équipé de ladite unité de détection de fumée, ladite unité de traitement du signal, ladite unité de transmission du signal et ladite unité d'alimentation,

- ladite unité de détection de fumée ayant ladite borne de sortie de densité de fumée connectée à ladite borne d'entrée de densité de fumée de ladite unité de traitement du signal,

- ladite unité de traitement du signal ayant ladite borne de sortie de détermination de fumée connectée à ladite borne d'entrée de détermination de fumée de la dite unité de transmission du signal,

- ladite unité de traitement du signal ayant ladite borne d'entrée d'interrogation connectée à ladite borne de sortie d'interrogation de ladite unité de transmission du signal,

- ladite unité de transmission du signal ayant ladite borne de sortie de signal multiplexé connectée à ladite borne d'entrée de signal multiplexé de ladite unité d'alimentation,

- ladite unité de transmission du signal ayant ladite borne d'entrée d'interrogation connectée à ladite borne de sortie d'interrogation de ladite unité d'alimentation,

- ladite unité d'alimentation ayant ladite borne dé sortie d'alimentation connectée audites bornes d'entrée d'alimentation de ladite unité de détection de fumée, ladite unité de traitement du signal et ladite unité de transmission du signal.

8. Détecteur d'incendie selon la revendication 4, dans lequel

- ledit détecteur d'incendie est équipé de ladite unité de détection de fumée, ladite unité de traitement du signal et ladite unité d'alimentation,

- ladite unité de détection de fumée ayant ladite borne de sortie de densité de fumée connectée à ladite borne d'entrée de densité de fumée de ladite unité de traitement du signal,

- ladite unité de traitement du signal ayant ladite borne de sortie de détermination de fumée connectée à ladite borne d'entrée de détermination de fumée de ladite unité d'alimentation,

- ladite unité d'alimentation ayant ladite borne de sortie d'alimentation connectée audites bornes d'entrée d'alimentation de ladite unité de détection de fumée et de ladite unité de traitement du signal.

9. Détecteur d'incendie selon la revendication 4, dans lequel

- ledit détecteur d'incendie est équipé de ladite unité de détection de fumée, ladite unité de transmission du signal et ladite unité d'alimentation,

- ladite unité de détection de fumée ayant ladite borne de sortie de détermination de fumée connectée à ladite borne d'entrée de détermination de fumée de ladite unité de transmission du signal,

- ladite unité de transmission du signal ayant ladite borne de sortie de signal multiplexé connectée à ladite borne d'entrée de signal multiplexé de ladite unité d'alimentation,

- ladite unité d'alimentation ayant ladite borne de sortie d'alimentation connectée audites bornes d'entrée d'alimentation de ladite unité de détection de fumée, de ladite unité de transmission du signal.

10. Détecteur d'incendie selon la revendication 4, dans lequel

- ledit détecteur d'incendie est équipé de ladite unité de détection de fumée et de ladite unité d'alimentation,

- ladite unité de détection de fumée ayant ladite borne de sortie de détermination de fumée connectée à ladite borne d'entrée de détermination de fumée de ladite unité d'alimentation,

- ladite unité d'alimentation ayant ladite borne de

sortie d'alimentation connectée à ladite borne d'entrée d'alimentation de ladite unité de détection de fumée.

11. Détecteur d'incendie selon la revendication 4, dans lequel

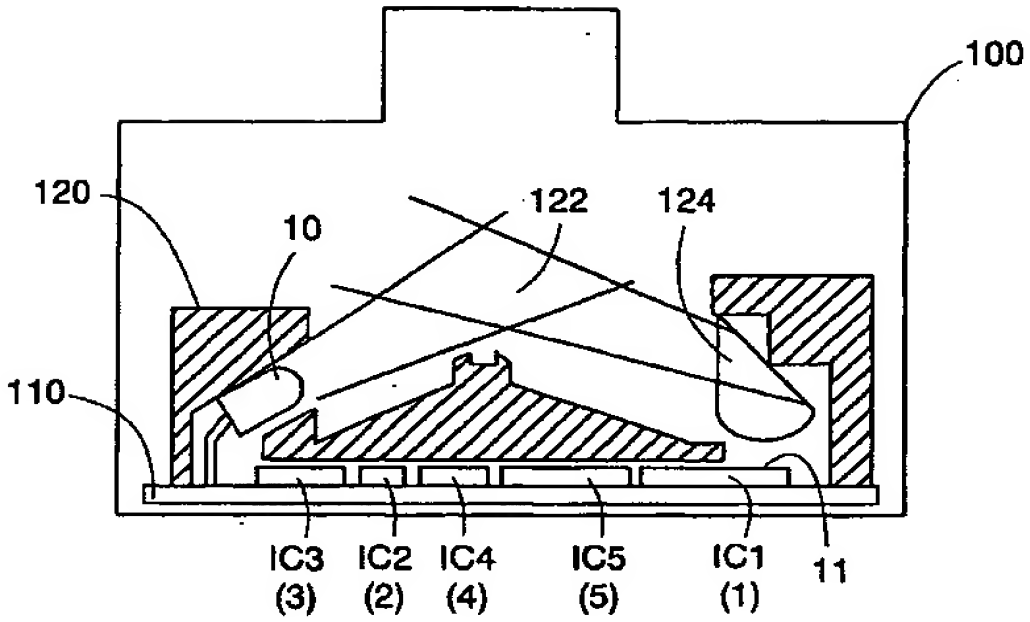
- ledit détecteur d'incendie est équipé de ladite unité à capteur thermique, ladite unité de traitement du signal, ladite unité de transmission du signal et ladite unité d'alimentation,
- ladite unité à capteur thermique ayant ladite borne de sortie de température connectée à ladite borne d'entrée de température de ladite unité de traitement du signal,
- ladite unité de traitement du signal ayant ladite borne de sortie de détermination de fumée connectée à ladite borne d'entrée de détermination de fumée de ladite unité de transmission du signal,
- ladite unité de traitement du signal ayant ladite borne d'entrée d'interrogation connectée à ladite borne de sortie d'interrogation de ladite unité de transmission du signal,
- ladite unité de transmission du signal ayant ladite borne de sortie de signal multiplexé connectée à ladite borne d'entrée de signal multiplexé de ladite unité d'alimentation,
- ladite unité de transmission du signal ayant ladite borne d'entrée d'interrogation connectée à ladite borne de sortie d'interrogation de ladite unité d'alimentation,
- ladite unité d'alimentation ayant ladite borne de sortie d'alimentation connectée audites bornes d'entrée d'alimentation de ladite unité à capteur thermique, de ladite unité de traitement du signal et ladite unité de transmission du signal.

12. Détecteur d'incendie selon la revendication 4, dans lequel

- ledit détecteur d'incendie est équipé de ladite unité à capteur thermique, ladite unité de traitement du signal et ladite unité d'alimentation,
- ladite unité de capteur thermique ayant ladite borne de sortie de température connectée à ladite borne d'entrée de température de ladite unité de traitement du signal,
- ladite unité de traitement du signal ayant ladite borne de sortie de détermination de fumée connectée à ladite borne d'entrée de détermination de fumée de ladite unité d'alimentation,

ladite unité d'alimentation ayant ladite borne de sortie d'alimentation connectée audites bornes d'entrée d'alimentation de ladite unité à capteur thermique, de ladite unité de traitement du signal.

FIG. 1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IC2
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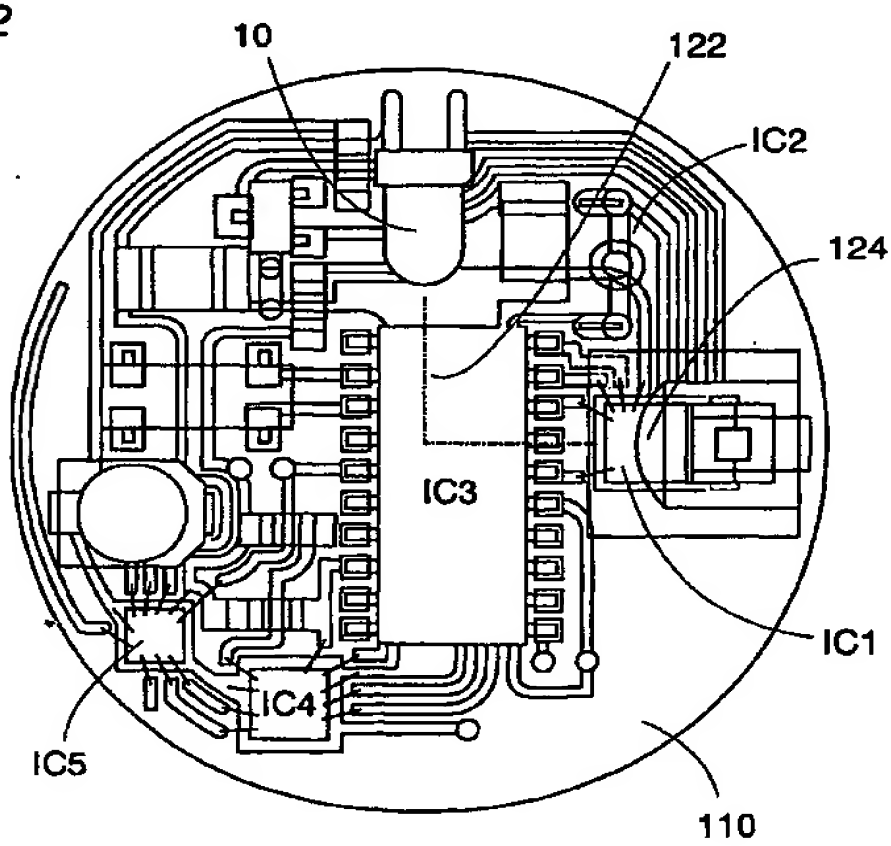
IC4
(4)
IC5
(5)
IC1
(1)
11

FIG. 2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IC2
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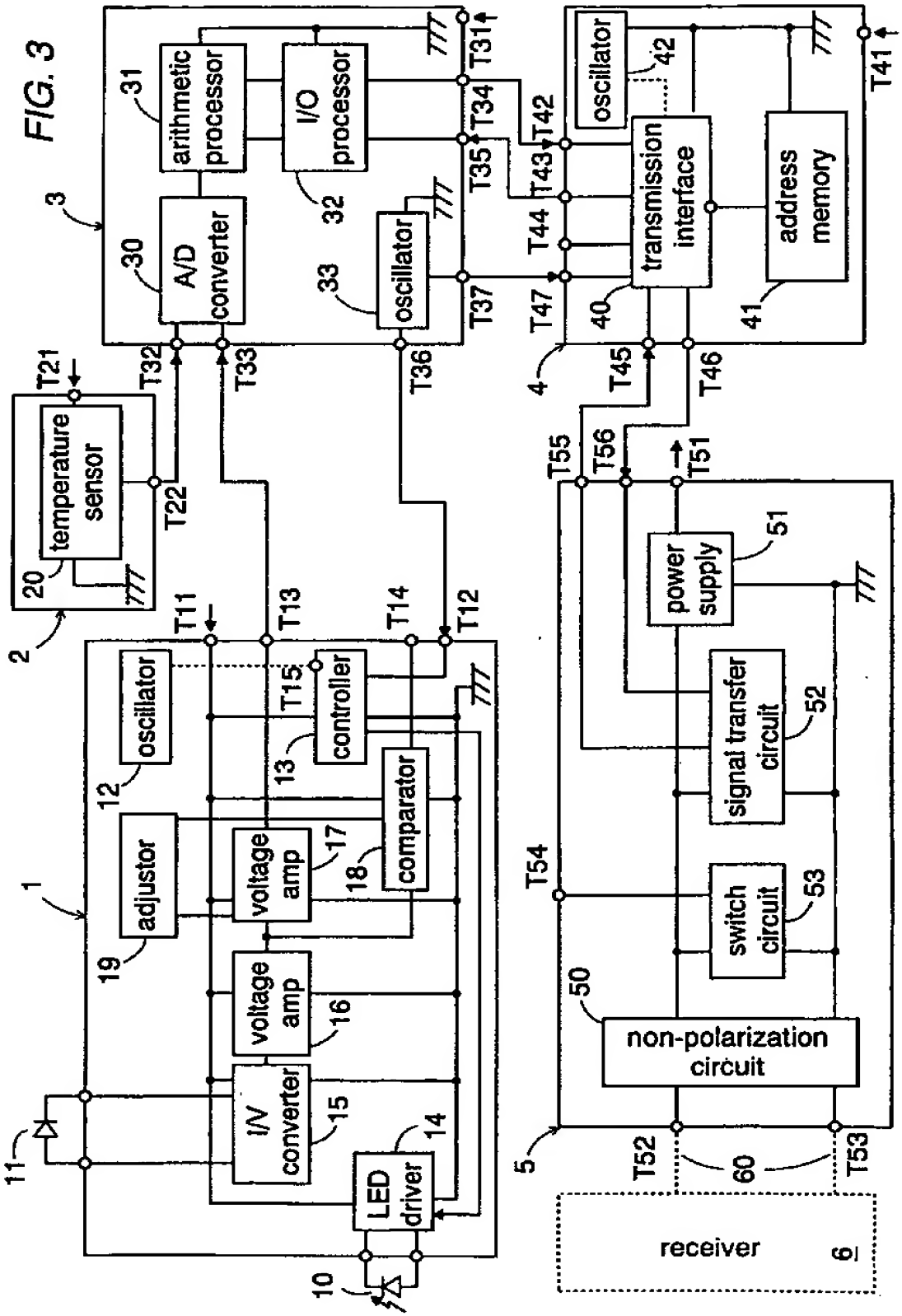
IC3
IC1
IC4
IC5
110

FIG. 3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T31
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T36
T21
temperature sensor
20
T22
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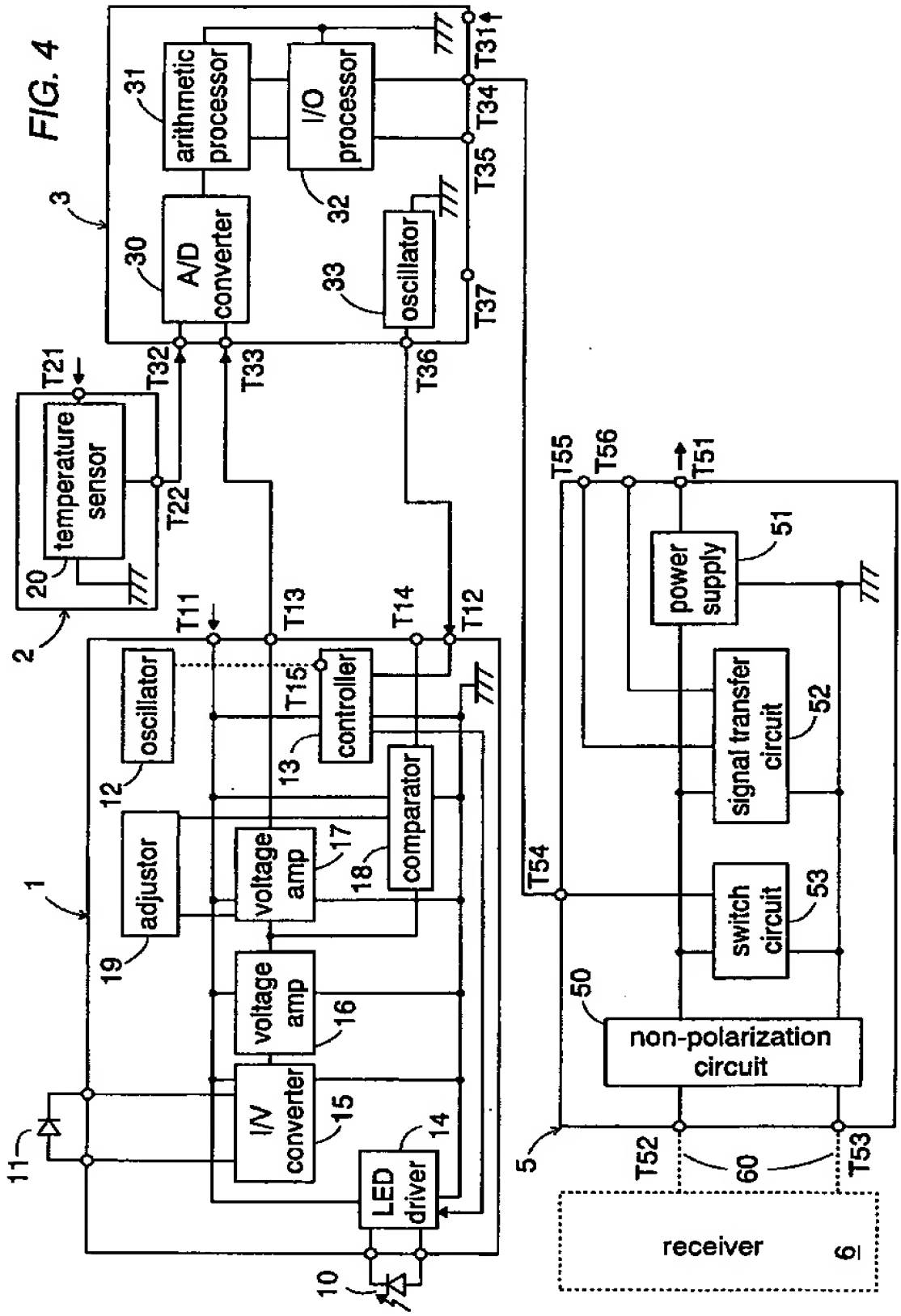
T11
T13
T14
T12
oscillator
12
controller
13
T15
adjustor
19
voltage amp
17
comparator
18
1
voltage amp
16
I/V converter
15
LED driver
14
11
10
T42
T43
T44
T47
oscillator
42
transmission interface
40
address memory
41
T41
4
T45
T46
T55
T56
T51
power supply
51
signal transfer circuit
52
T54
switch circuit
53
50
non-polarization circuit
5
T52
60
T53
receiver
6

FIG. 4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temperature sensor
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controller
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oscillator
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adjustor
19
voltage amp
17
comparator
18
1
voltage amp
16
I/V converter
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LED driver
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power supply
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signal transfer circuit
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T54
switch circuit
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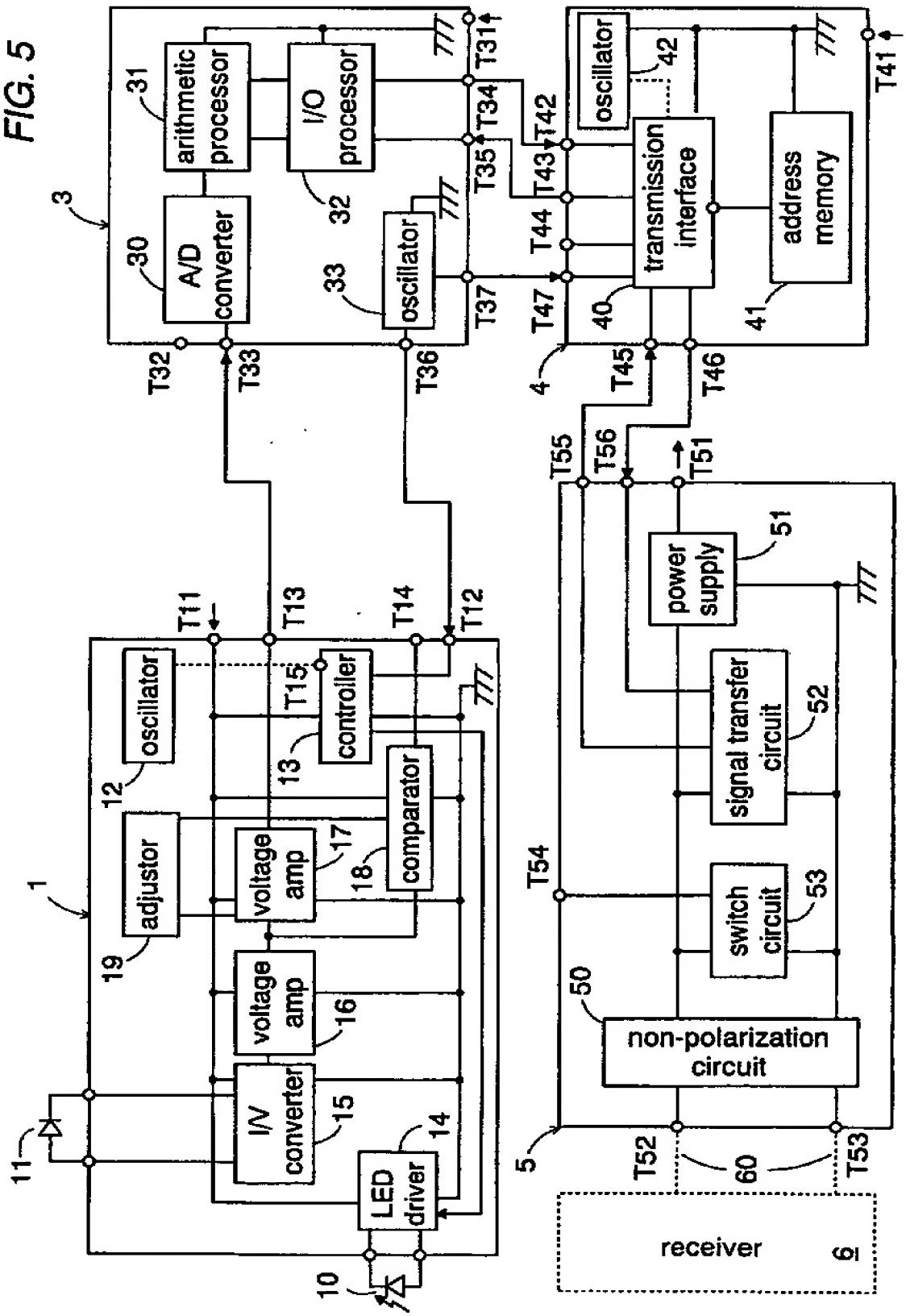
50
non-polarization circuit
5
T52
60
T53
receiver
6

FIG. 5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oscillator
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transmission interface
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address memory
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power supply
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signal transfer circuit
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switch circuit
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non-polarization circuit
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T52
60
T53
receiver
6
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oscillator
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adjustor
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voltage amp
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voltage amp
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LED driver
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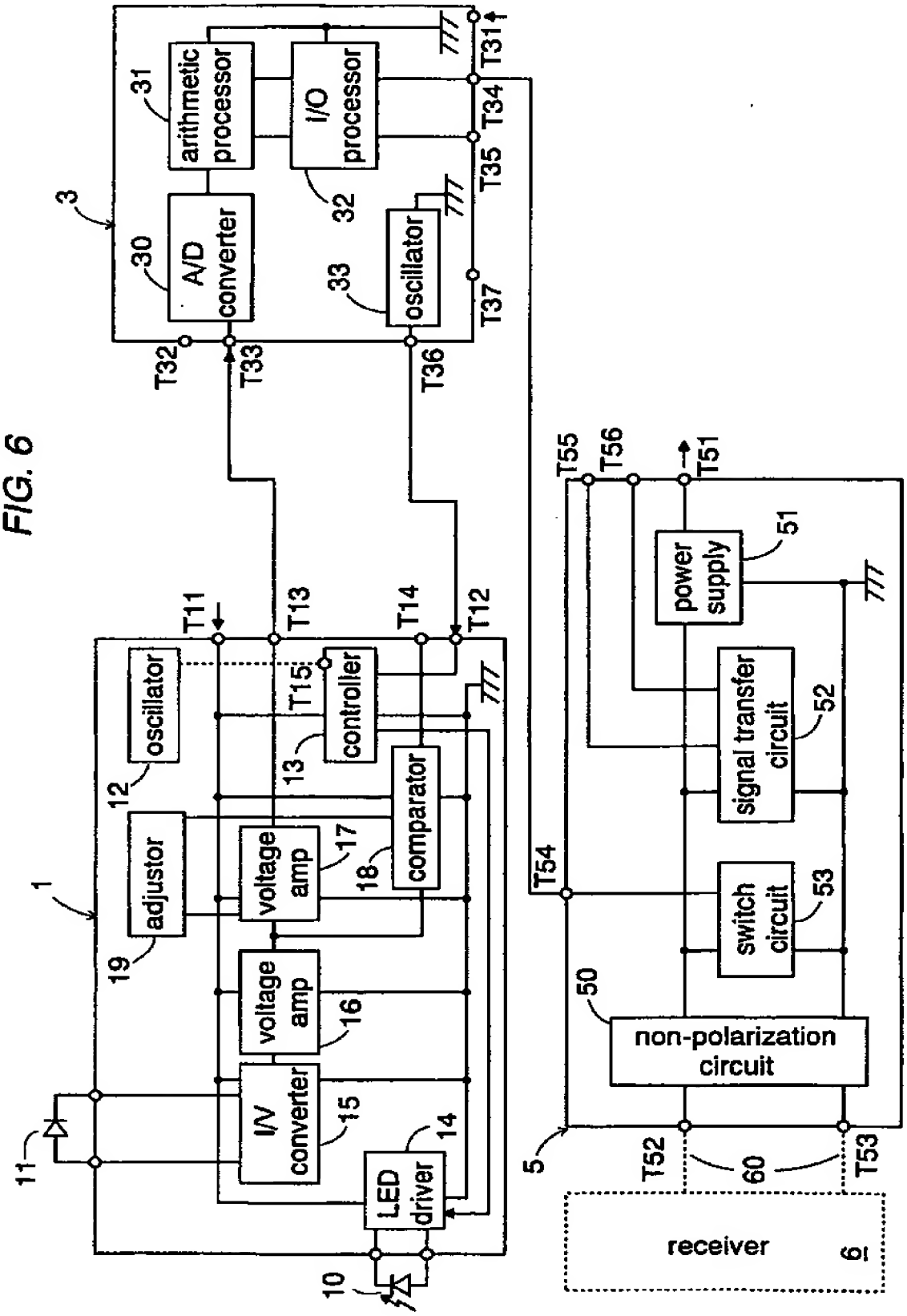
T15
controller
13
comparator
18

FIG. 6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oscillator
12
adjustor
19
voltage amp
17
voltage amp
16
I/V converter
15
LED driver
14
comparator
18
controller
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T15
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T12
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T55
T56
T51
power supply
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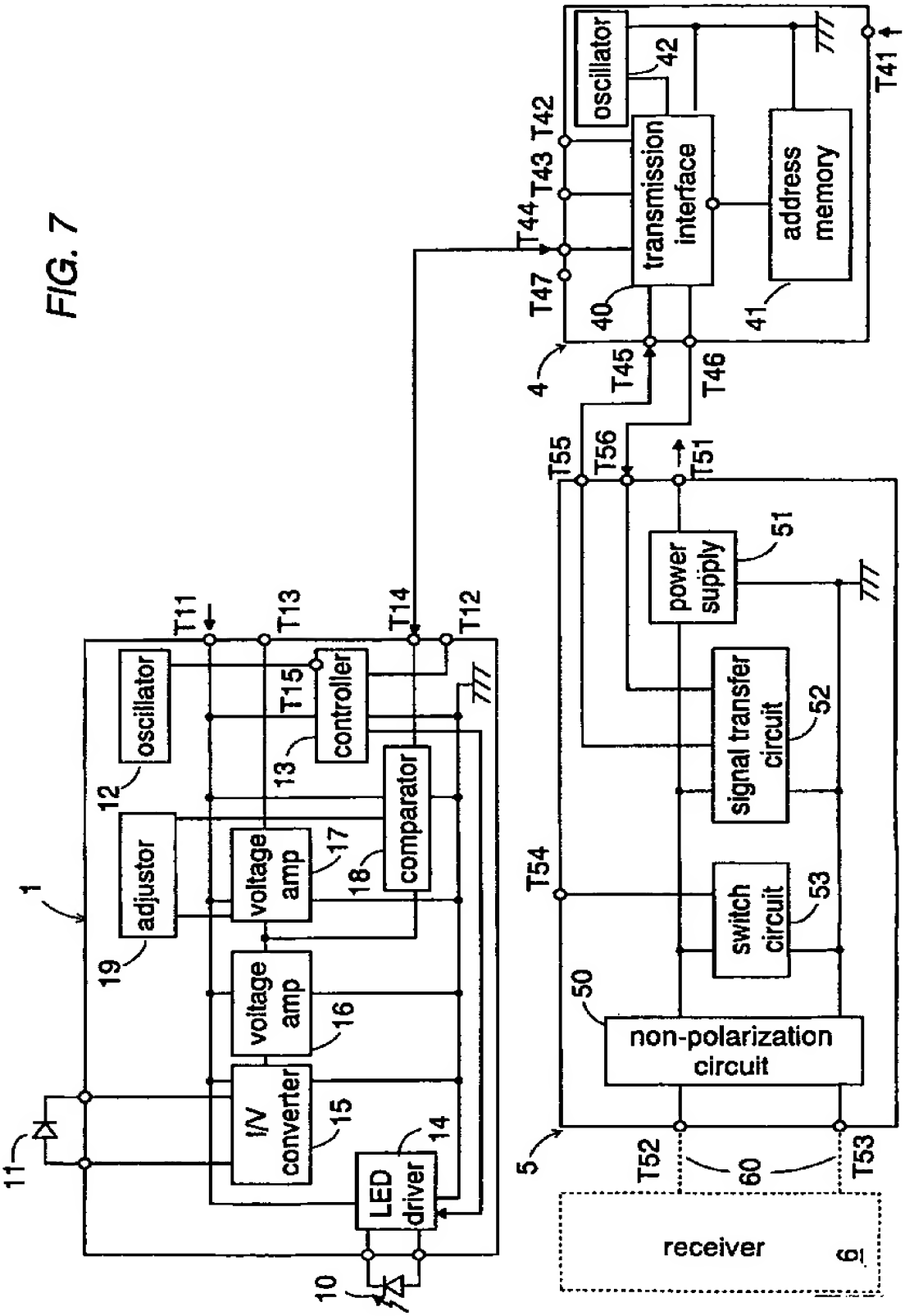
signal transfer circuit
52
switch circuit
53
T54
50
non-polarization circuit
5
T52
60
T53
receiver
6

FIG. 7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19
17
18
16
15
14
13
oscillator
transmission interface
address memory
T41
T42
T43
T44
T47
T45
T46
4
40
41
42
power supply
signal transfer circuit
switch circuit
non-polarization circuit
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T56
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T54
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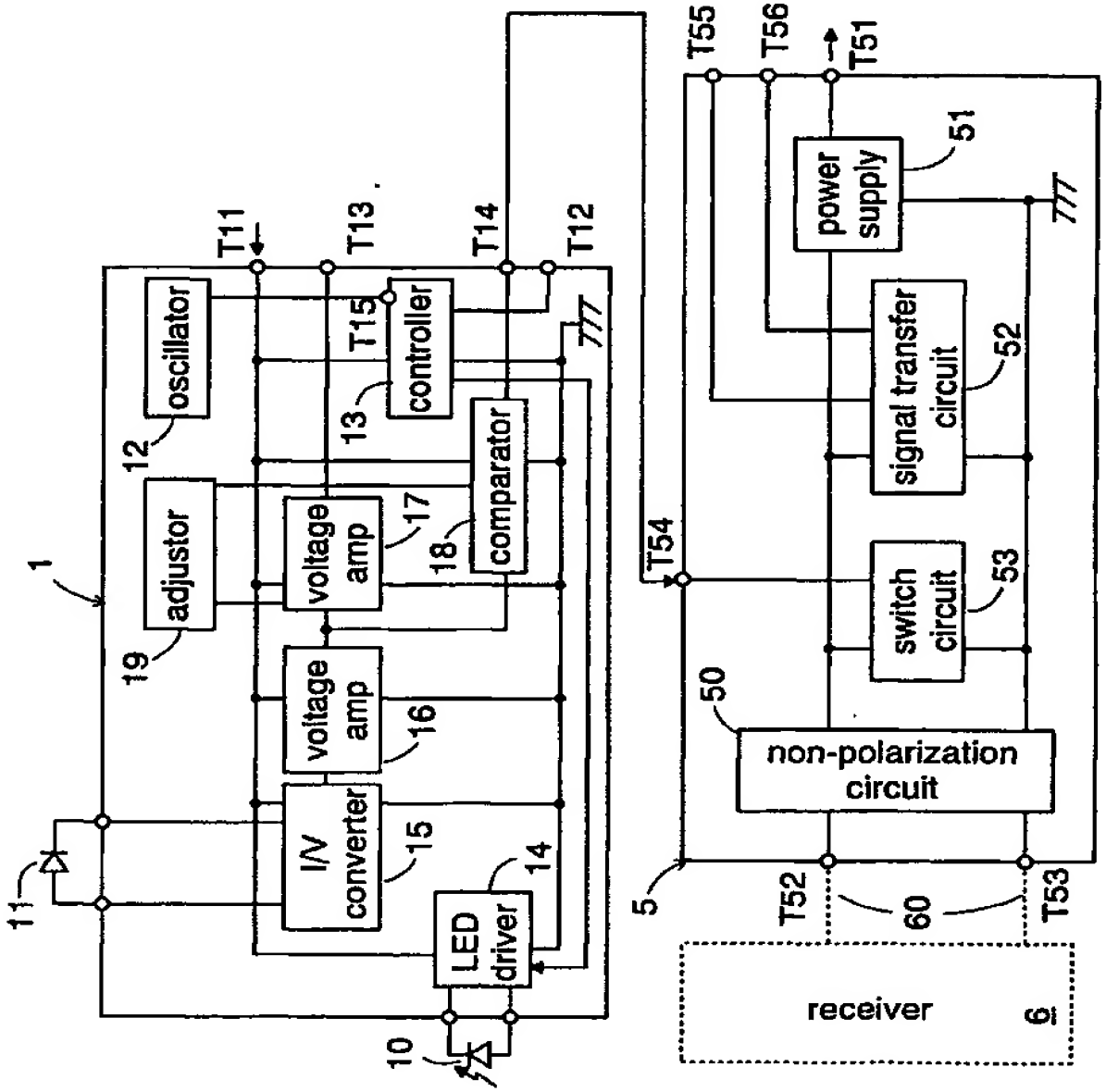
T53
5
50
51
52
53
60
receiver
6

FIG. 8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voltage amp
17
voltage amp
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I/V converter
15
LED driver
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comparator
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controller
13
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777
T54
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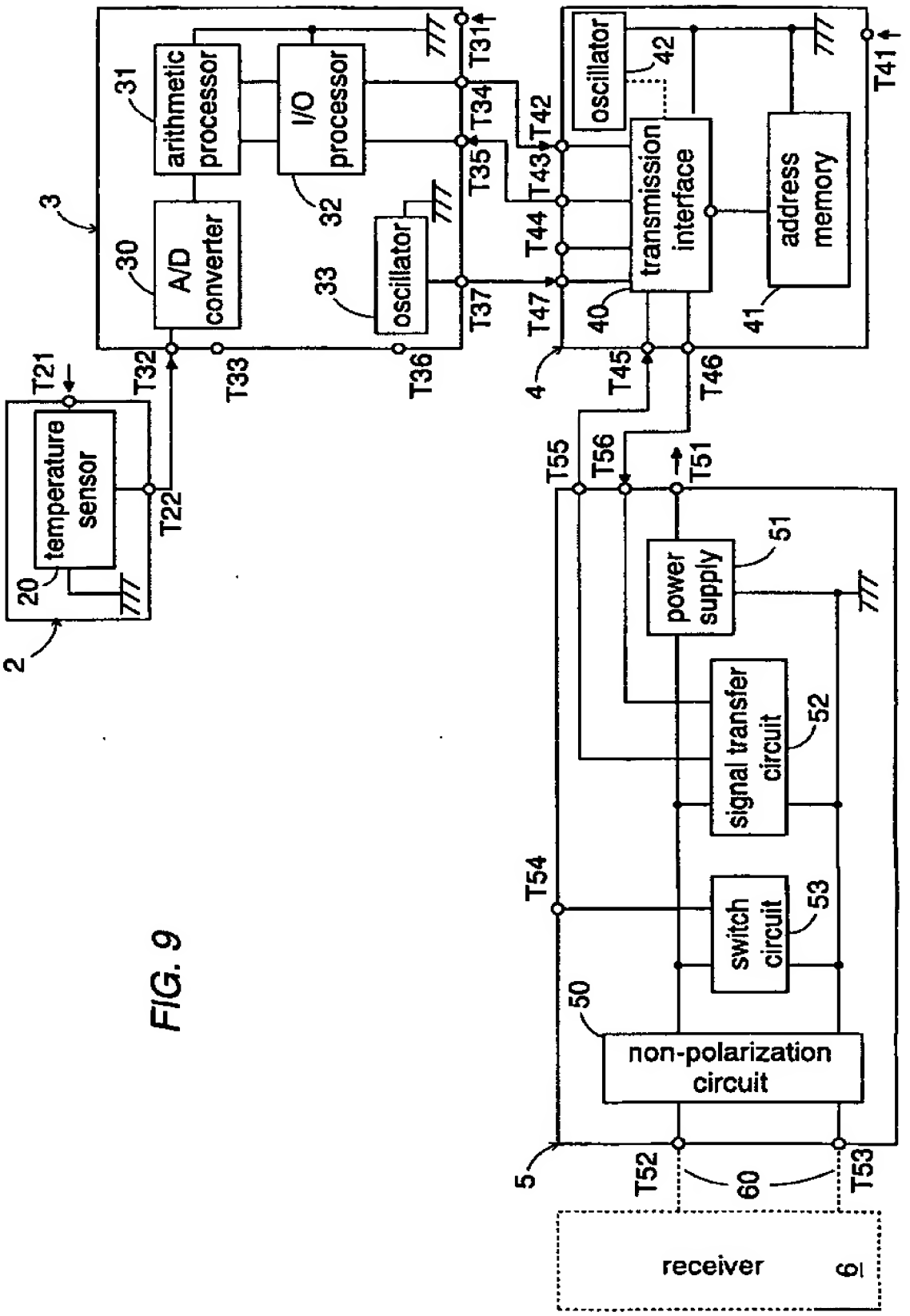
signal transfer circuit
52
switch circuit
53
non-polarization circuit
50
5
T52
60
T53
receiver
6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I/O processor
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A/D converter
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oscillator
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T31
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T35
T37
T36
T32
T33
T21
T22
temperature sensor
20
2
T42
T43
T44
T47
oscillator
42
transmission interface
40
address memory
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T41
4
T45
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T55
T56
T51
power supply
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signal transfer circuit
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T54
switch circuit
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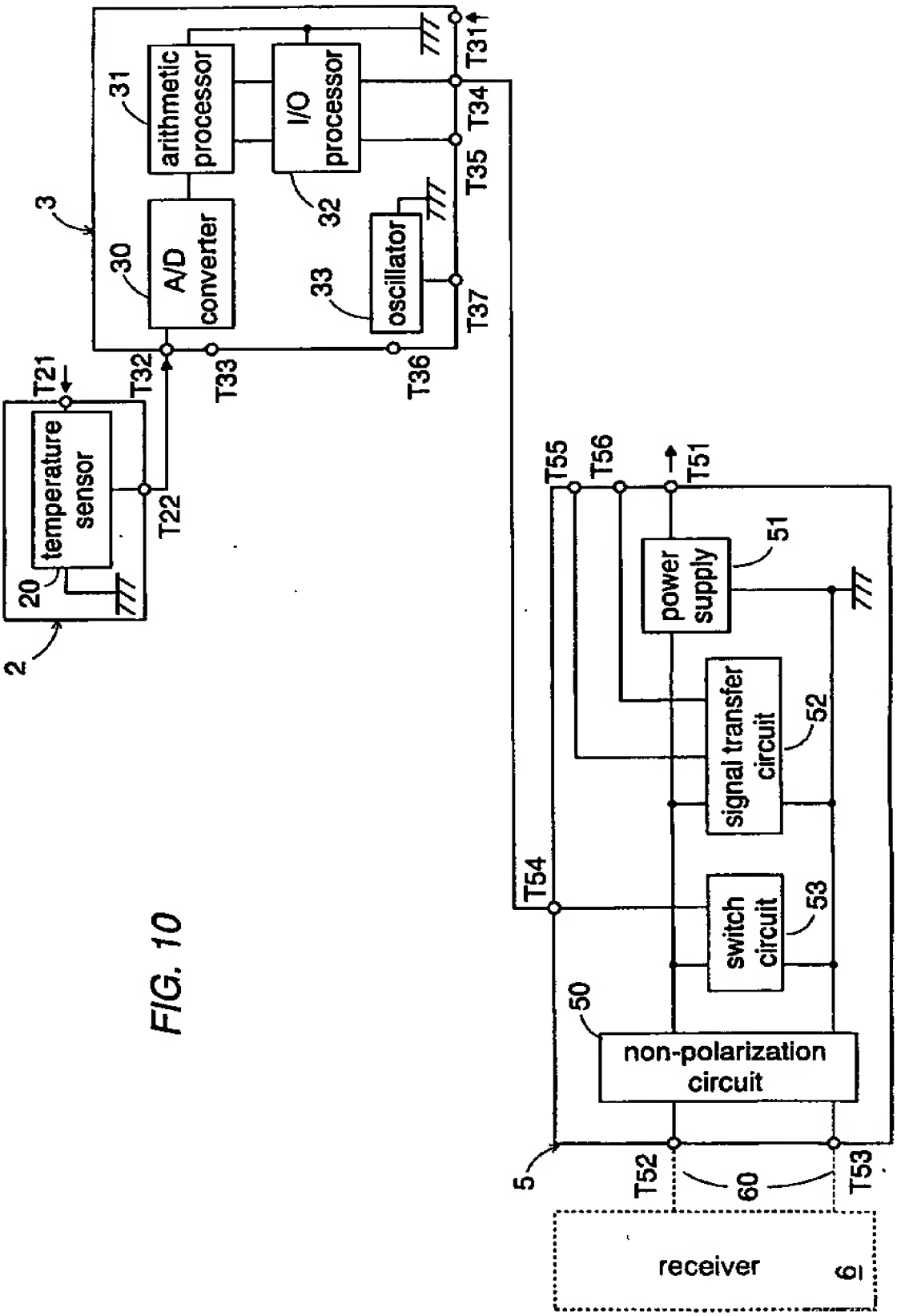
50
non-polarization circuit
5
T52
T53
60
receiver
6

FIG. 9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T32
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T22
temperature sensor
20
2
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T56
T51
power supply
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signal transfer circuit
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T54
switch circuit
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50
non-polarization circuit
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T52
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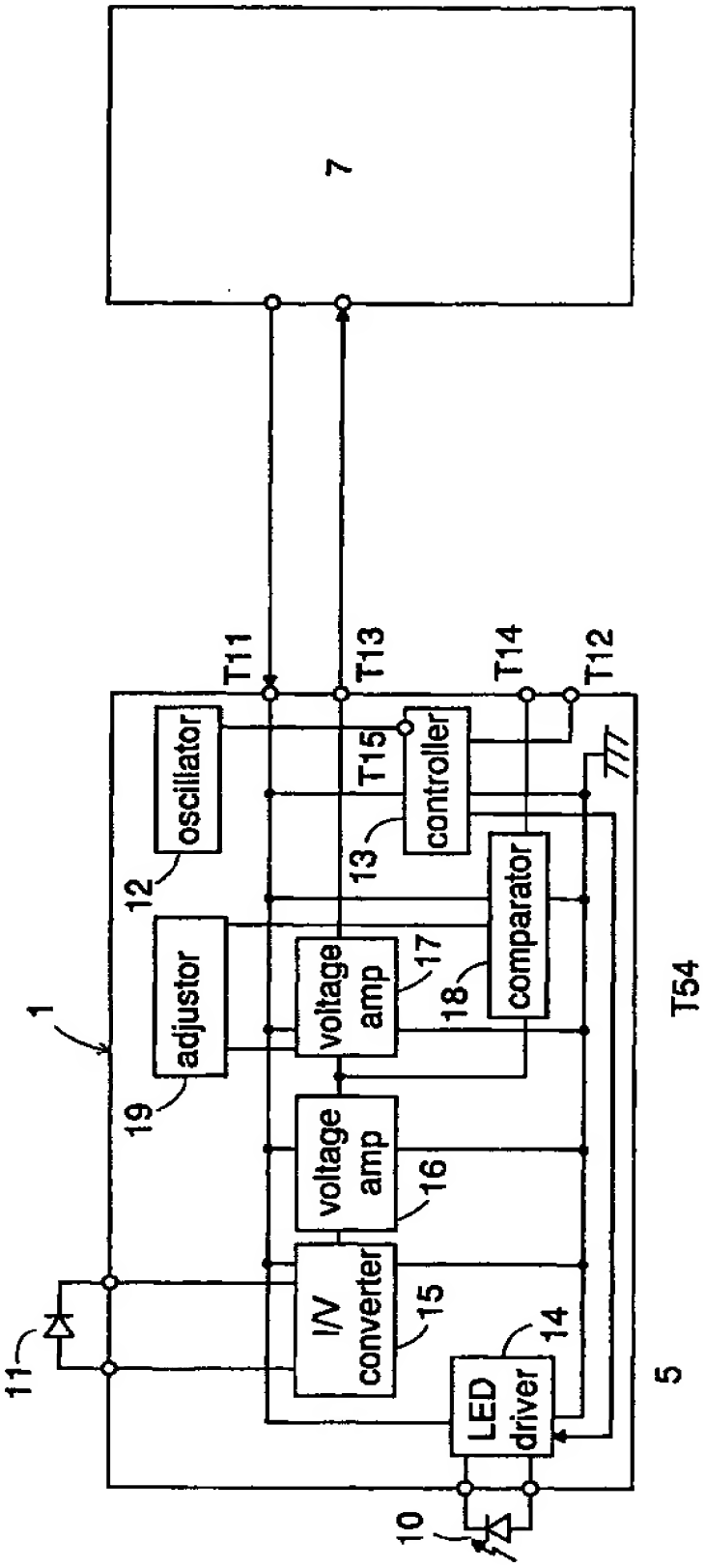
T53
receiver
6

FIG. 10

FIG. 11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I/V converter
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LED driver
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1
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10
5
T54
777